



INSTRUCTION MANUAL

DUAL BAND FM TRANSCEIVER

IC-3220A

IC-3220E

IC-3220H



Icom Inc.

IMPORTANT

READ THIS INSTRUCTION MANUAL CAREFULLY before attempting operation. If you have any questions regarding the operation of the IC-3220A/E/H, feel free to contact your nearest authorized Icom Dealer or Service Center.

SAVE THIS INSTRUCTION MANUAL — This instruction manual contains important safety and operating instructions for the IC-3220A/E/H.

FOREWORD

Thank you for choosing this Icom product.

The **IC-3220A/E/H** is a 144 and 430 (440) MHz dual band mobile transceiver. The **IC-3220A/E/H** is a compact, easy-to-operate and multi-function transceiver designed using Icom's state-of-the-art technology.

CAUTIONS

NEVER connect the transceiver to an AC outlet. This will ruin the transceiver.

NEVER connect more than 16 V DC power supplies or batteries to the transceiver. Check the power source before connecting the power cable.

NEVER place the transceiver where normal operation of the vehicle may be hindered or where it could cause bodily injury.

NEVER allow children to touch the transceiver.

DO NOT use or place the transceiver in areas with temperatures below -10°C ($+14^{\circ}\text{F}$) or over $+60^{\circ}\text{C}$ ($+140^{\circ}\text{F}$).

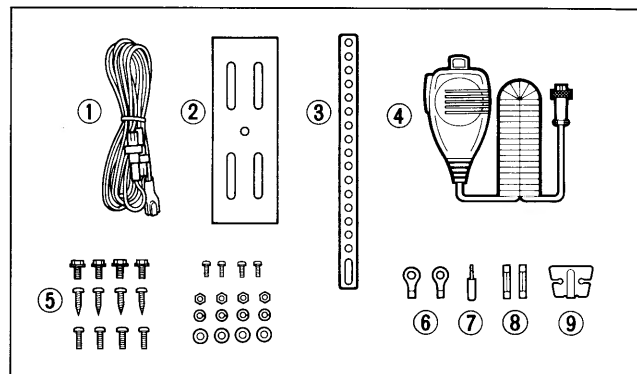
AVOID placing the transceiver in direct sunlight, such as on the dashboard.

BE CAREFUL! The heatsink may become hot when operating the transceiver continuously for long periods.

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UNPACKING



Accessories included with the IC-3220A/E/H:	Qty.
① DC power cable (OPC-044B)	1
② Mounting bracket (MB-27)	1
③ Mounting support bracket	1
④ Microphone*	1
⑤ Mounting screws, nuts and washers	1 set
⑥ Cable lugs	2
⑦ External speaker plug	1
⑧ Fuses (15 A)	2
⑨ Microphone hanger	1

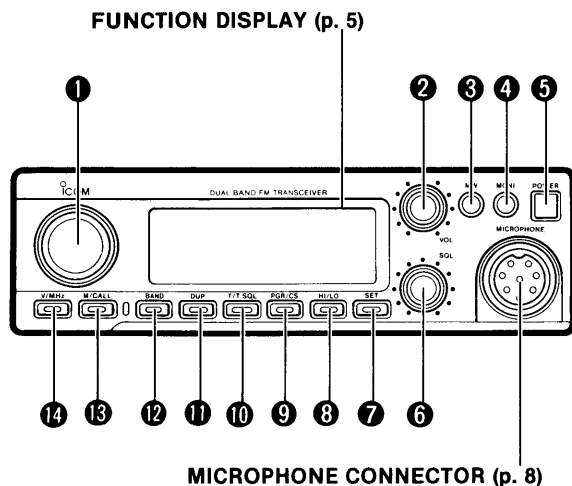
* HM-56 for U.S.A. and Asia versions.

HM-58 for Australia version.

HM-59 for Europe and Italy versions.

PANEL DESCRIPTION

■ Front panel



1 MAIN DIAL

Changes the operating frequency, the memory channel, the contents of the SET mode display and the scanning direction.

2 VOLUME CONTROL [VOL]

Adjusts the audio output level.

3 MEMORY WRITE SWITCH [MW] (p. 21)

Programs a memory channel or a call channel.

Transfers the contents of a memory channel or a call channel to the VFO.

4 MONITOR SWITCH [MONI] (p. 17)

Opens the squelch of the transmit frequency.

5 POWER SWITCH [POWER]

Turns the power ON and OFF.

6 SQUELCH CONTROL [SQL]

Sets the main band squelch threshold level.

The sub band threshold level is fixed regardless of this control.

7 SET MODE SWITCH [SET] (p. 13)

Accesses SET mode and advances the SET mode displays.

Activates the lock function when pushed and held.

8 TRANSMIT POWER SWITCH [HI/LO] (p. 17)

Sets the transmit power to high or low.

Reverses the SET mode display in SET mode.

9 PAGER/CODE SQUELCH SWITCH [PGR/CS]

(pgs. 33, 34)

Activates the pager or code squelch function when an optional UT-55 DTMF ENCODER/DECODER UNIT is installed.

10 TONE SWITCH [T/T. SQL] (pgs. 20, 35)

Turns ON the subaudible tone encoder when an optional UT-50 TONE SQUELCH UNIT or *UT-51 PROGRAMMABLE TONE ENCODER UNIT is installed.

Turns ON the pocket beep or tone squelch function when the UT-50 is installed.

* The U.S.A. version already has this unit.

11 DUPLEX SWITCH [DUP] (p. 19)

Selects simplex, –duplex, +duplex.

Activates the memory split function when pushed and held in MEMORY mode.

12 BAND SWITCH [BAND]

Selects the VHF or UHF band.

Turns ON the full duplex function when pushed and held.

13 MEMORY/CALL CHANNEL SWITCH [M/CALL]

Selects MEMORY mode or CALL CHANNEL mode.

Activates the priority watch function when pushed and held.

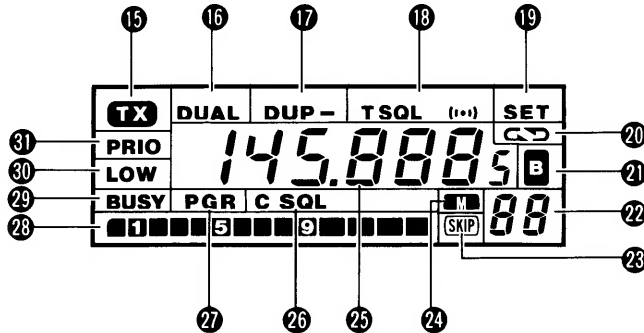
14 VFO/MHz SWITCH [V/MHz]

Selects VFO mode in other modes.

Sets the tuning step to MHz step in VFO mode.

1 PANEL DESCRIPTION

■ Function display



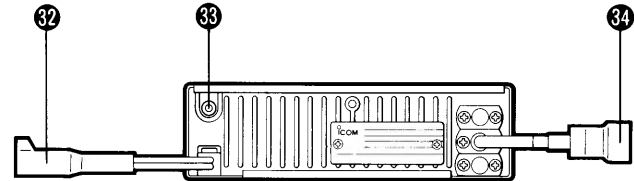
- 15 **TRANSMIT INDICATOR** (p. 17)
Appears while transmitting.
- 16 **DUAL WATCH INDICATOR** (p. 16)
Appears when the dual watch function is activated.
- 17 **DUPLEX INDICATOR** (p. 19)
“DUP-” or “DUP” appears when semi duplex is selected for repeater operation.

- 18 **TONE INDICATORS** (pgs. 20, 35)
“T” appears when the tone encoder is turned ON.
“T SQL” appears when the optional tone squelch function is activated.
“T SQL (•••)” appears when the optional pocket beep function is activated.
- 19 **SET MODE INDICATOR** (p. 13)
Appears when SET mode is selected.
- 20 **MEMORY SPLIT INDICATOR** (p. 22)
Appears when a memory channel with the memory split function is selected.
- 21 **SUB BAND BUSY INDICATOR** (p. 16)
Appears when the sub band squelch opens.
- 22 **MEMORY CHANNEL READOUT**
Displays the memory channel number.
Displays large “C” when CALL CHANNEL mode is selected.
Displays “L” when the dial lock function is activated.
- 23 **SKIP INDICATOR** (p. 26)
Appears when a memory channel is programmed to be skipped during memory scan.

- 24 MEMORY INDICATOR** (p. 21)
Appears when MEMORY mode is selected.
- 25 FREQUENCY READOUT**
Displays the operating frequency (except during SET mode).
- 26 CODE SQUELCH INDICATOR** (p. 34)
Appears when the optional code squelch function is activated.
- 27 PAGER INDICATOR** (p. 33)
Appears when the optional pager function is activated.
- 28 S/RF INDICATOR**
Displays the relative strength of a received signal.

Displays output power selection while transmitting.
- 29 BUSY INDICATOR**
Appears when the main band squelch opens.
- 30 LOW POWER INDICATOR**
Appears when low power is selected.
- 31 PRIORITY WATCH INDICATOR** (p. 27)
Appears when the priority watch function is activated.

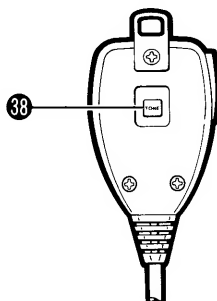
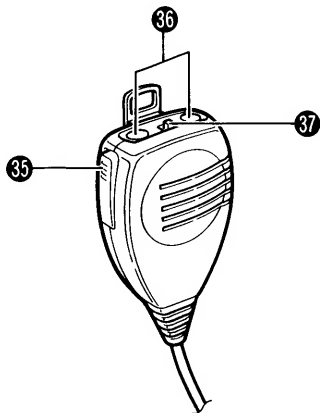
■ Rear panel



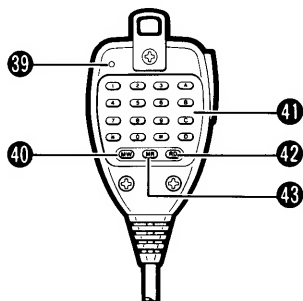
- 32 POWER RECEPTACLE** (p. 10)
Accepts 13.8 V DC with the supplied DC power cable.
- 33 EXTERNAL SPEAKER JACK**
Connects a 4~8 Ω speaker.
- 34 ANTENNA CONNECTOR** (p. 11)
Connects a 50 Ω dual band antenna with a PL-259 connector to the transceiver.

1 PANEL DESCRIPTION

■ Microphone



HM-59



HM-56

35 PTT SWITCH

Push and hold to transmit.

36 FREQUENCY UP/DOWN SWITCHES [UP]/[DN]

Push either switch to change the operating frequency or memory channel.

Push and hold either switch to start scanning.

[UP] may be used as the programmable remote control function. (p. 29)

37 LOCK SWITCH [LOCK]

Prevents accidental key entry of all keys except the PTT switch.

38 TONE CALL SWITCH (HM-59 only)

Push and hold to transmit a 1750 Hz tone signal.

39 ACTIVE INDICATOR (HM-56 only)

Lights when a key is pushed or tone is being transmitted.

40 MEMORY WRITE KEY [MW] (HM-56 only)

Used when writing a DTMF code into a DTMF code memory channel.

41 16-KEY KEYBOARD (HM-56 only)

Transmits the appropriate DTMF code.

These keys are also used for DTMF code memory reading and writing.

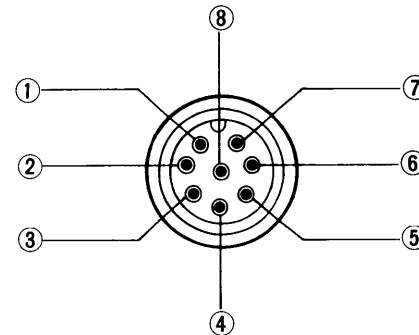
42 REDIAL KEY [RD] (HM-56 only)

Used when recalling and transmitting the last-transmitted DTMF code.

43 MEMORY READ KEY [MR] (HM-56 only)

Used when recalling and transmitting a DTMF code in a DTMF code memory channel.

• MICROPHONE CONNECTOR (Front panel view)



- ① MIC INPUT
- ② +8 V DC OUTPUT
- ③ FREQ UP/DOWN
- ④ NO CONNECTION
- ⑤ PTT
- ⑥ GND (PTT ground)
- ⑦ GND (Microphone ground)
- ⑧ AF DETECTOR OUTPUT

■ Location

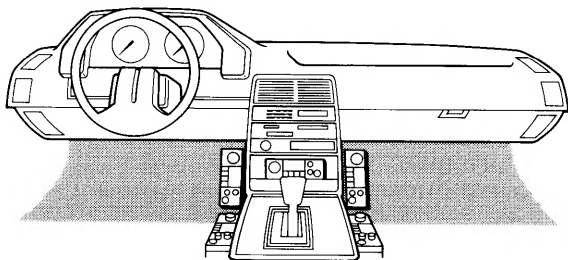
Select a location which can support the weight of the transceiver and does not interfere with driving in any way. We recommend the locations shown in the diagram below.

NEVER place the transceiver where normal operation of the vehicle may be hindered or where it could cause bodily injury.

DO NOT place the transceiver where hot or cold air blows directly onto it.

AVOID placing the transceiver in direct sunlight.

• EXAMPLE INSTALLATION LOCATIONS

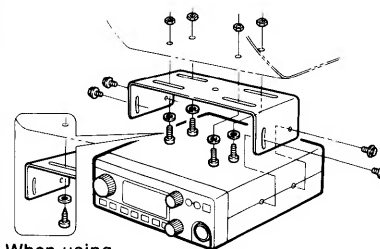


■ Mounting

- 1) Drill 4 holes where the mounting bracket is to be installed.
- 2) Insert the supplied screws, nuts and washers through the mounting bracket and tighten.
- 3) The supplied mounting support bracket may be of help in achieving tight installation.
- 4) Adjust the angle for the clearest view of the function display.

• MOUNTING PROCEDURE

- Hole sizes:
Approx. 5.5~6 mm when using nuts.
Approx. 2~3 mm when using self-tapping screws.
(1 mm ÷ 1/32 in)



When using self-tapping screws.

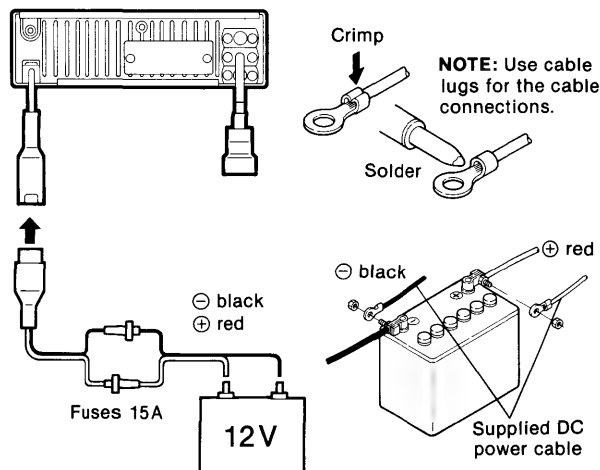
18°

■ Battery connection

NEVER connect the transceiver to a 24 V battery.
DO NOT use the cigarette lighter socket for power connections.

To prevent voltage drops, solder or crimp the cable lug when connecting the power cable to the battery.

• CONNECTING TO A DC POWER SOURCE



■ AC power supply connections

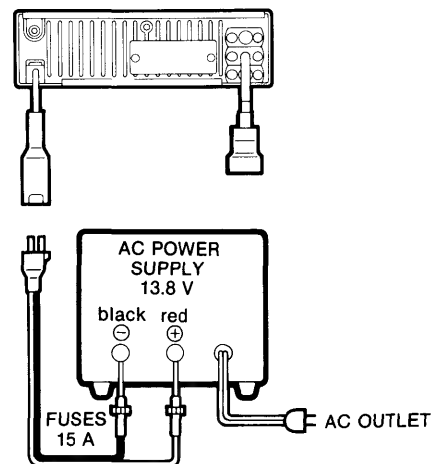
Use a 13.8 V DC power source as below:

IC-3220A/E: More than 8 A capability.

IC-3220H: More than 10 A capability.

Make sure the ground terminal of the AC power supply is grounded.

• CONNECTING TO AN AC POWER SUPPLY



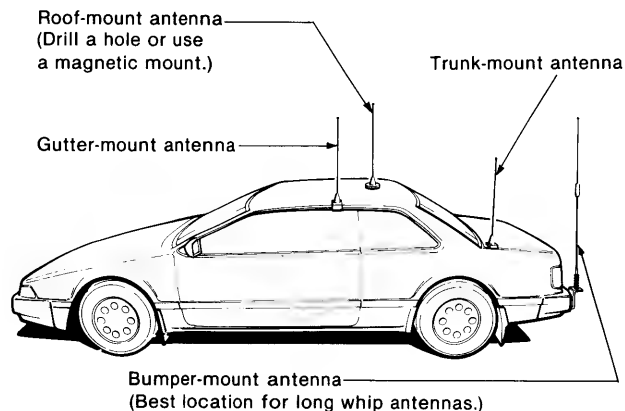
2 INSTALLATION

■ Antenna connection

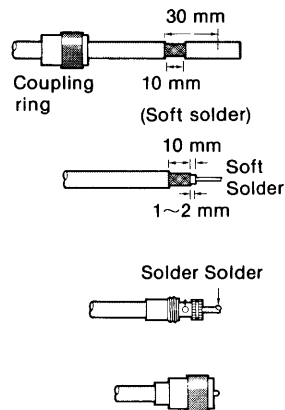
You can use a dual band antenna because a duplexer is installed in the IC-3220A/E/H. However, an external duplexer must be connected when using a separate antenna for each band.

To obtain maximum performance from the transceiver, select a high-quality antenna and a good location for it.

• ANTENNA LOCATION



• ANTENNA CONNECTOR (PL-259)



1) Slide the coupling ring over the coaxial cable.

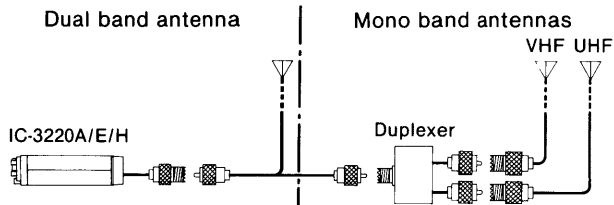
2) Strip the cable as shown in the diagram, and soft solder the center conductor.

3) Slide the connector body onto the cable and solder.

4) Screw the coupling ring onto the connector body.

(10 mm \approx 3/8 in)

• ANTENNA CONNECTION



Mode types

The IC-3220A/E/H has 4 different modes on each band, VHF and UHF, for multi-function operations.

• VFO MODE

Used for normal operations.

145.680

• MEMORY MODE

Used for operating the transceiver using memory channel contents. 18 memory channels are available for programming in each band.

145.880

• CALL CHANNEL MODE

Used for programming your most-often-used channel.

146.520

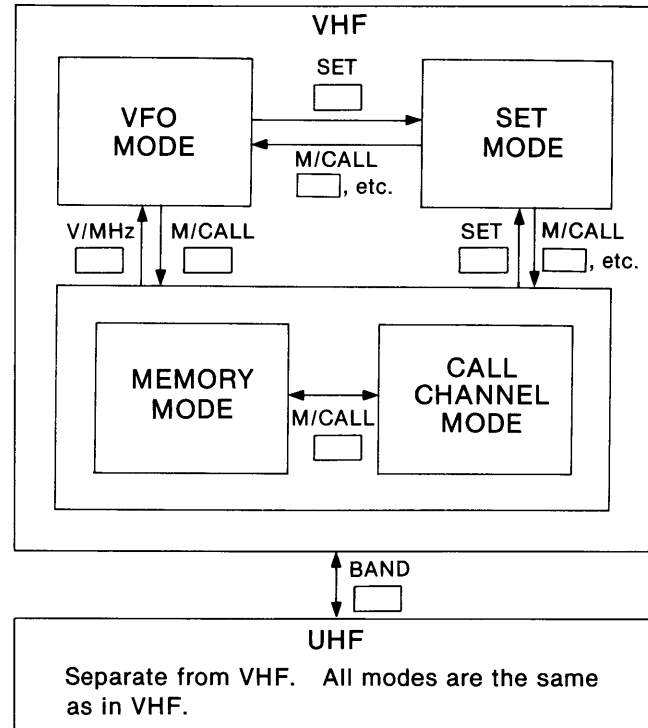
• SET MODE

Used for initializing the transceiver conditions as described on p. 13.

d-4

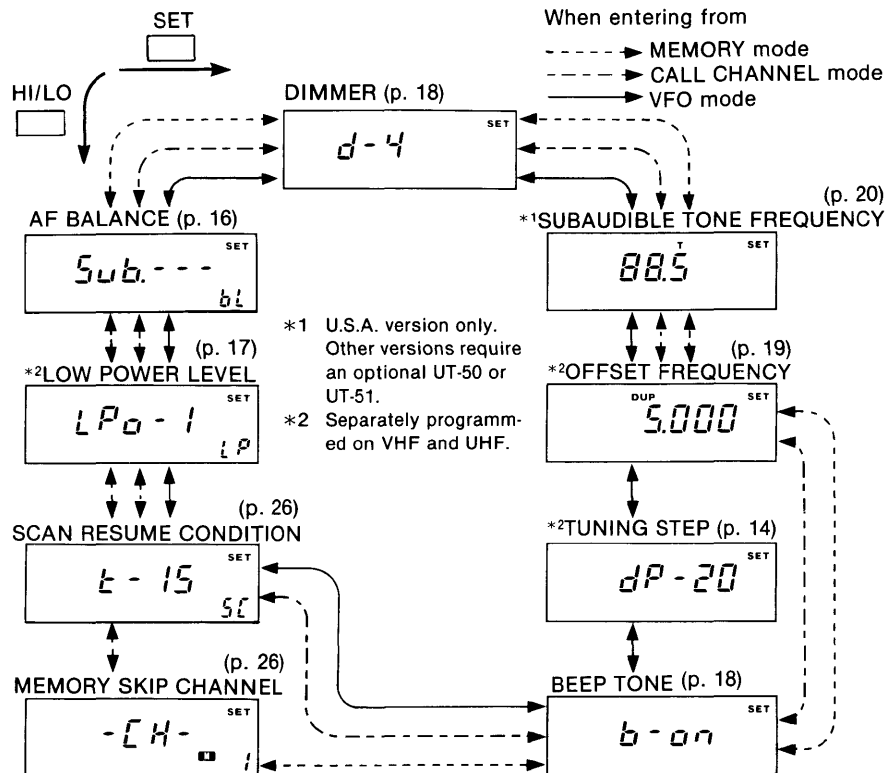
Mode construction chart

The 4 different modes are connected as described in the following chart.



3 MODE CONSTRUCTION

■ Set mode construction



• SELECTING SET MODE

- 1) Push [BAND] to select the desired band.
- 2) Select a mode, VFO, MEMORY or CALL CHANNEL.
- 3) Push [SET] to enter SET mode.

NOTE:

If no operation is performed for 30 sec. in SET mode, the transceiver returns to the previous mode automatically.

When setting the tuning step, enter SET mode from VFO mode.

When setting the memory skip channel, enter SET mode from MEMORY mode.

■ Frequency setting

The operating frequency can be set with the main dial or the microphone [UP]/[DN] switches.

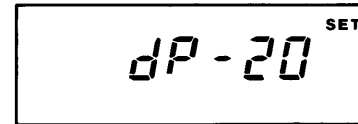
- 1) Push IN [POWER] to turn ON power.
- 2) Push [BAND] to select VHF or UHF.
 - When “L” appears on the function display, see p. 15 regarding cancelling the dial lock function.
- 3) Push [V/MHz] to select VFO mode.
 - When the kHz digits disappear, push [V/MHz] again.
- 4) Rotate the main dial or push [UP] or [DN] on the microphone to change the frequency.
 - The tuning step can be changed as described at right.
 - Push [V/MHz] for a 1 MHz tuning step.

NOTE: When a programmable remote control function is activated, [UP]/[DN] switches cannot be used for frequency setting. See p. 29 for details.

USING SET MODE

• TUNING STEP SELECTION

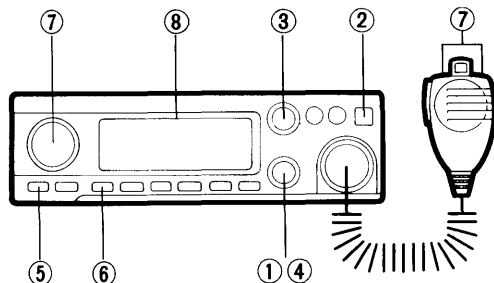
VFO mode → SET mode
V/U separate setting



- 1) Push [BAND] to select VHF or UHF.
- 2) Push [V/MHz] to select VFO mode.
- 3) Push [SET] several times until “dP” appears on the function display as shown above.
 - Refer to p. 13 for SET mode details.
- 4) Rotate the main dial for the desired tuning step.
 - 5, 10, 12.5, 15, 20, 25 kHz steps are available.
- 5) Push any switch except [SET] and [HI/LO], or push PTT to set the value and to exit SET mode.

4 BASIC OPERATION

■ Receiving

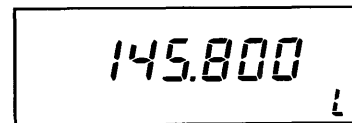


- 1) Rotate [SQL] to maximum counterclockwise.
- 2) Push IN [POWER] to turn ON power.
- 3) Rotate [VOL] to adjust the audio level.
- 4) Rotate [SQL] clockwise until noise disappears.
- 5) Push [V/MHz] to select VFO mode when another mode is selected.

- 6) Push [BAND] to select the desired band.
- 7) Set the operating frequency using the main dial or [UP] and [DN] on the microphone.
- 8) When receiving a signal on the set frequency:
 - Squelch opens and the transceiver emits audio.
 - “BUSY” appears.
 - The S/Rf indicator shows relative signal strength.

• DIAL LOCK FUNCTION

The dial lock function locks the main dial and switches except [SET], [MONI] and PTT to prevent the operating frequency and function from changing accidentally.



Push and hold [SET] until “L” appears on the function display.

- To cancel the function, push and hold [SET] until “L” disappears.

■ Watching dual bands

The dual watch function allows you to receive both VHF and UHF bands simultaneously.

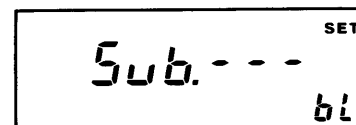
- 1) Set the desired frequencies to be received on the main and sub bands.
 - 2) Push [BAND] to set either frequency as the main band.
 - The displayed frequency is the main band frequency.
 - 3) Push and hold [BAND] until "DUAL" appears to activate the dual watch function.
- "BUSY" appears when the main band squelch opens.
 - "B" appears when the sub band squelch opens.
 - The sub band squelch is set to the appropriate position automatically. Manual setting is not available.
 - When activating this function in MEMORY or CALL CHANNEL mode, the last used memory or call channel on the other band is set on the sub band automatically.
 - AF balance can be programmed. See at right.
- 4) To cancel the function, repeat step 3.

USING SET MODE

• AF BALANCE ADJUSTMENT

V/U same setting

When operating the dual watch or full duplex, AF balance between the main and sub bands can be set.



- 1) Push [SET] several times until "bL" appears and blinks on the function display as shown above.
 - Refer to p. 13 for SET mode details.
- 2) Rotate the main dial to set the condition.

Sub. —	Sub band AF level is the same as the main band one.
Sub. dn1~ Sub. dn3	Sub band AF level is 1~3 degrees down from the main band one.
Sub. Aut	Sub band AF level is the same as the main band one. However, sub band AF level is automatically 3 degrees down when both main and sub band signals are received.

- 3) Push any switch except [SET] and [HI/LO], or push PTT to set the value and to exit SET mode.

4 BASIC OPERATION

■ Transmitting

CAUTION: Transmitting without an antenna may damage the transceiver.

NOTE: To prevent interference, listen on the frequency before transmitting using [MONI].

Voice transmission is not possible while the active indicator on the HM-56 lights or blinks.

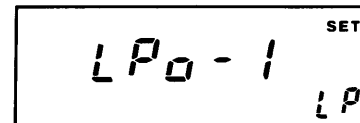
- 1) If "DUP" or "DUP—" appears on the display, push [DUP] until it disappears if operating in simplex.
 - To operate with a repeater see p. 19.
- 2) Push [HI/LO] to select the output power.
 - "LOW" appears when selecting low output power and disappears when selecting high output power.
 - Low output power level can be changed. See SETTING THE LOW POWER LEVEL as shown at right.
- 3) Push and hold [PTT] to transmit.
 - "TX" appears while transmitting.
 - The S/RF indicator shows output power selection.
- 4) Speak into the microphone.
 - **DO NOT** hold the microphone too close to your mouth or speak too loudly. This may distort the signal.
- 5) Release [PTT] to receive.

• CROSSBAND FULL DUPLEX OPERATION

- 1) Push and hold [BAND] for more than 1 sec.
 - "DUAL" appears and the dual watch function is activated.
- 2) Push and hold [PTT] to activate full duplex.
 - Main band (displayed band) is the transmit band; sub band is the receive band.

USING SET MODE

• SETTING THE LOW POWER V/U separate setting LEVEL



- 1) Push [BAND] to select VHF or UHF.
- 2) Push [SET] several times until "LP" appears and blinks on the function display as shown above.
 - Refer to p. 13 for SET mode details.
- 3) Rotate the main dial to set the desired low power level.
 - LPo-1: 5 W (IC-3220H), 1 W (IC-3220A/E).
 - LPo-2: 10 W (IC-3220H), 10 W (IC-3220A/E).
- 4) Push any switch except [SET] and [HI/LO], or push PTT to set the value and to exit SET mode.

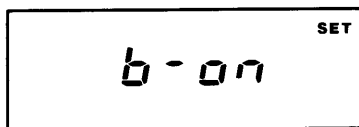
■ Beep tone and dimmer

USING SET MODE

• BEEP TONE ON/OFF

V/U same setting

You can select silent operation with beep tone OFF or confirmation operation with beep tone ON.



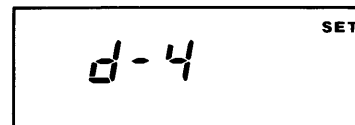
- 1) Push [SET] several times until "b-on" or "b-off" appears on the function display as shown above.
 - Refer to p. 13 for SET mode details.
- 2) Rotate the main dial to set the condition.
 - "b-on": Beep tone ON
 - "b-off": Beep tone OFF
- 3) Push any switch except [SET] and [HI/LO], or push PTT to set the condition and to exit SET mode

USING SET MODE

• DIMMER ADJUSTMENT

V/U same setting

Adjust the intensity according to lighting conditions and personal preference.



- 1) Push [SET] several times until one of "d-1"~"d-4" appears on the function display as shown above.
 - Refer to p. 13 for SET mode details.
- 2) Rotate the main dial to set the desired intensity.
 - The intensity level can be changed in 4 steps for d-1 (Dark)~d-4 (Bright).
- 3) Push any switch except [SET] and [HI/LO], or push PTT to set the value and to exit SET mode.

4 BASIC OPERATION

■ Operating through a repeater

When operating through a repeater, set the transceiver to duplex. Some repeaters require a subaudible tone, 1750 Hz tone or DTMF tone.

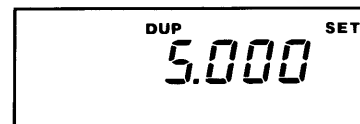
- 1) Set the operating frequency. (p. 14)
- 2) Push [DUP] for –duplex and again for +duplex.
 - “DUP–” or “DUP” appears.
 - “DUP–”: Transmit freq. = Receive freq. – Offset freq.
 - “DUP”: Transmit freq. = Receive freq. + Offset freq.
- 3) Set the desired offset frequency.
 - See at right for details.
- 4) Push and hold [PTT] to transmit.
 - The operating frequency on the function display automatically changes to the transmit frequency (repeater input frequency).
 - See the right page when the repeater requires a tone.
- 5) Release [PTT] to receive.
 - Push [MONI] to check whether the transmit frequency (repeater input frequency) is busy or not.

- 6) To return to simplex, push [DUP] until “DUP” disappears.

USING SET MODE

• OFFSET FREQUENCY SETTING

V/U separate setting



- 1) Push [BAND] to select VHF or UHF.
- 2) Push [SET] several times until “DUP” blinks on the function display as shown above.
 - Refer to p. 13 for SET mode details.
- 3) Rotate the main dial to set the desired offset frequency.
 - Use [V/MHz] for quick MHz setting.
- 4) Push any switch except [V/MHz], [SET] and [HI/LO], or push PTT to set the value and to exit SET mode.

NOTE: When the transmit frequency is out of the band, transmission is impossible and “oFF” appears on the function display.

• CTCSS SUBAUDIBLE TONE

(An optional UT-50 or UT-51 is necessary except for U.S.A. version.)

Push [T/T.SQL] until only "T" appears.

To set a subaudible tone frequency, use SET mode. See at right for details.

• DTMF TONES (U.S.A. and Asia versions)

Push the desired digit keys on the microphone to transmit DTMF tones.

See p. 37 for advanced DTMF operation. (Only for U.S.A. and Asia versions)

• 1750 Hz TONE CALL

With HM-59 (Europe and Italy versions):

Push and hold [TONE] on the microphone for about 1~3 sec. to transmit a 1750 Hz tone call signal.

With HM-56 (U.S.A. and Asia versions):

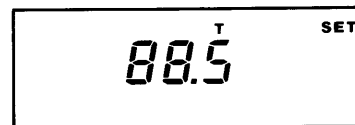
Refer to "HM-56 ADVANCED FUNCTIONS." (p. 37)

USING SET MODE

• SUBAUDIBLE TONE FREQUENCY SETTING

V/U separate setting

(An optional UT-50 or UT-51 is necessary except for U.S.A. version.)



- 1) Push [BAND] to select VHF or UHF.
- 2) Push [SET] several times until "T" appears and blinks on the function display.
 - Refer to p. 13 for SET mode details.
- 3) Rotate the main dial to set the desired subaudible tone frequency.

67.0	91.5	118.8	156.7	210.7
71.9	94.8	123.0	162.2	218.1
74.4	97.4*	127.3	167.9	225.7
77.0	100.0	131.8	173.8	233.6
79.7	103.5	136.5	179.9	241.8
82.5	107.2	141.3	186.2	250.3
85.4	110.9	146.2	192.8	
88.5	114.8	151.4	203.5	

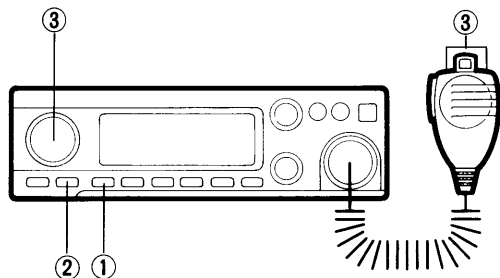
* Not included
with the UT-50.

(Unit: Hz)

- 4) Push any switch except [SET] and [HI/LO], or push PTT to set the value and to exit SET mode.

■ Selecting a memory channel

18 memory channels are available in each band for storing your often-used frequencies such as those used with repeaters, group calls, etc.



- 1) Push [BAND] to select VHF or UHF.
- 2) Push [M/CALL] until "M" and a memory channel number appear on the function display to select MEMORY mode.
- 3) Rotate the main dial to select the desired memory channel.
 - [UP]/[DN] can also be used for selecting.
 - Memory channel numbers P1 and P2 are used for the programmable scan edges.

■ Programming a memory channel

You can program the following data into a memory channel:

- Operating frequency
- Duplex information (DUP or DUP-)
- Offset frequency
- Subaudible tone frequency*1
- Tone encoder ON/OFF*1
- Tone squelch ON/OFF*2

*1 An optional UT-50 or UT-51 is necessary except for the U.S.A. version.

*2 An optional UT-50 is necessary.

- 1) Select the memory channel for programming as described at left.
- 2) Push [V/MHz] to select VFO mode.
 - "M" disappears.
- 3) Set the desired data as described above to be programmed into the memory channel.
- 4) Push and hold [MW] for 2 sec.
 - If the beep tone is ON, 3 beeps alert you that the contents are programmed.
- 5) After the contents are written into the memory channel and you want to check them, push [M/CALL] to select the memory channel.

■ Transferring memory data

You can transfer the contents of a memory channel into the VFO.



- 1) Call up the desired memory channel as described on p. 21.
- 2) Push and hold [MW] for 2 sec.
 - The contents are transferred to the VFO.
 - The transceiver goes into VFO mode automatically.

■ Memory split function

This function allows you to operate different frequencies for transmitting and receiving using a pair of memory channels.

One memory channel is an odd number and the other is an even number. Memory channels 1 and 2, 3 and 4, 5 and 6,..... 17 and 18 can be used.

- 1) Push [BAND] to select VHF or UHF.
- 2) Set the memory split condition when the transceiver is not in the condition.
 - See at right.

- 3) Push [M/CALL] to select MEMORY mode.
- 4) Push and hold [DUP] until “” appears.
 - The function is activated.
- 5) Select the memory channel programmed as your desired receive frequency.
 - While transmitting, the function display shows the other side of a pair of memory channels
 - To program the memory channel, see p. 21 Programming a memory channel.
- 6) To return to normal memory channel operation, push and hold [DUP] until “” disappears.

WITH **POWER ON**

• SETTING THE MEMORY SPLIT CONDITION

The transceiver must be in the memory split condition when operating the memory split function. No indications appear even if the transceiver is in the memory split condition.

- 1) Turn power OFF.
- 2) While pushing and holding [DUP] and [MONI], turn power ON. Then release these switches.
- 3) To cancel the condition, reset the CPU. See p. 40 for details.

■ Calling up a call channel

One call channel is equipped with each band. The call channels are programmable for storing your most-often-used frequencies. The call channels are separate from the memory channels.

- 1) Push [BAND] to select VHF or UHF.
- 2) Push [M/CALL] until "C" appears.
 - A call channel is selected.
- 3) To return to VFO mode, push [V/MHz].
To return to MEMORY mode, push [M/CALL].

■ Programming a call channel

- 1) Call up the desired band call channel as described above.
 - "C" appears.
- 2) Push [V/MHz] to select VFO mode.
 - "C" changes to small "c".
- 3) Set the desired frequency (and duplex when required) to be programmed into the call channel.

- 4) Push and hold [MW] for 2 sec.
- 5) After the frequency is written into the call channel and you want to check the contents, push [M/CALL] to select the call channel.

■ Transferring the contents of a call channel

The contents of a call channel can be transferred into a VFO.

- 1) Call up the desired call channel as described at left.
- 2) Push and hold [MW] for 2 sec.
 - The transceiver goes into VFO mode automatically.
 - "C" changes to small "c".

■ Operating scan

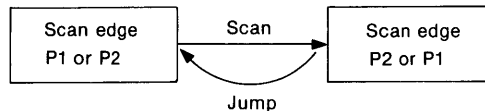
There are 3 scan functions for your convenience as described below.

NOTE: When tone squelch is activated during scan, the scan only stops when a signal with the same tone is received.

(1) Scan types

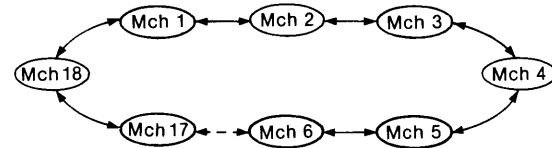
• PROGRAMMED SCAN

Repeatedly scans between two user-programmed scan edges, memory channel P1 and P2.



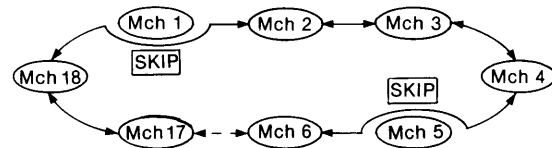
• MEMORY SCAN

Repeatedly scans all memory channels.



• MEMORY SKIP SCAN

Repeatedly scans all memory channels while skipping memory channels you do not wish to scan. This is an additional function of the memory scan as above.



7 SCANNING OPERATION

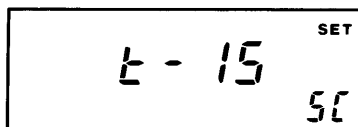
(2) Scan operation

Refer to the following table for any scan operation.
However, before operating a scan, rotate [SQL]
clockwise until noise is muted.

SCAN TYPE	PRE-OPERATION	START	SCAN DIRECTION	RESUME CONDITION	STOP
Programmed scan	1) Program scan edges. (p. 26) 2) Select VFO mode.	Push and hold [UP] or [DN] on the microphone for 1 sec. •When activating the programmable remote control function, push [DN] to start the scan.	Use the main dial to change the scan direction.	4 types of resume condition are available. Set the desired condition using SET mode in advance. (p. 26)	Push [UP] or [DN].
Memory scan	Select MEMORY mode.				
Memory skip scan	1) Set memory skip channels. (p. 26) 2) Select MEMORY mode.				

USING SET MODE

• SETTING RESUME CONDITION V/U same setting



- 1) Push [SET] several times until "SC" appears on the function display as shown above.
 - Refer to p. 13 for SET mode details.
- 2) Rotate the main dial to set the desired timer.
 - t-5: Scan resumes 5 sec. after the scan pauses.
 - t-10: Scan resumes 10 sec. after the scan pauses.
 - t-15: Scan resumes 15 sec. after the scan pauses.
 - P-2: Scan pauses until signal disappears and resumes after 2 sec.
- 3) Push any switch except [SET] and [HI/LO], or push PTT to set the value and to exit SET mode.

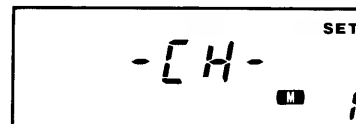
• SETTING PROGRAM SCAN EDGES

Memorize scan edge frequencies in the memory channels P1 and P2 as in "Programming a memory channel" on p. 21.

- P1 is next to memory channel 18.
- VHF and UHF scan edge frequencies must be separately programmed.

USING SET MODE

• SETTING MEMORY SKIP CHANNEL MEMORY mode → SET mode



- 1) Push [M/CALL] until "M" and a memory channel number appear on the function display to select MEMORY mode.
- 2) Select the memory channel to be set as a skip channel.
- 3) Push [SET] several times until "-CH-" appears on the function display.
 - Refer to p. 13 for SET mode details.
- 4) Rotate the main dial to illuminate the "SKIP" indicator.
 - "SKIP": The memory channel is skipped during memory scan.
 - " " : The memory channel is scanned during memory scan.
- 5) Push any switch except [SET] and [HI/LO], or push PTT to set the condition and to exit SET mode.

■ Priority watch

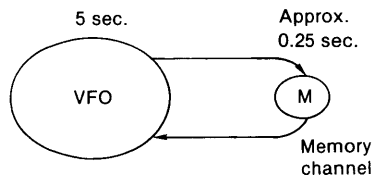
Every 5 sec. priority watch monitors a watching frequency while you operate on the VFO frequency. There are 3 types of priority watch as described below.

NOTE: When tone squelch is activated during priority watch, the watch only pauses when a signal with the same tone is received.

(1) Priority watch types

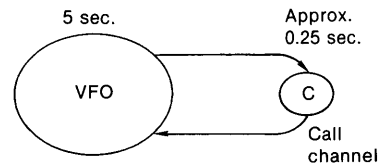
• VFO ↔ Memory channel

While operating on VFO mode, priority watch monitors the selected memory channel at 5 sec. intervals.



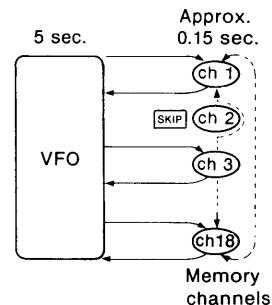
• VFO ↔ Call channel

While operating on VFO mode, priority watch monitors the call channel at 5 sec. intervals.



• VFO ↔ Memory scan

While operating on VFO mode, priority watch monitors all memory channels in sequence except memory channels programmed as a skip channel.



(2) Priority watch operation

Refer to the following table regarding priority watch operation. However, before operating a priority watch, rotate [SQL] clockwise until noise is muted.

PRIORITY WATCH TYPE	PRE-OPERATION	START	RESUME CONDITION	STOP
VFO ↓ Memory channel	Set the memory channel to be watched.	Push and hold [M/CALL] for 2 sec. •“PRIO” appears.	4 types of resume condition are available. Set the desired condition using SET mode in advance. (p. 26)	Push [M/CALL] or [MW] to return to main band VFO mode. •Push [BAND] to return to sub band VFO mode. •Push [SET] to return to SET mode. •Push [PGR/CS] to return to main band VFO and activate the pager function.
VFO ↓ Call channel	Set the call channel to be watched.			
VFO ↓ Memory scan	Start the memory scan. (p. 25)			

The [UP] switch on the microphone can be changed temporarily to one of the switches on the front panel.

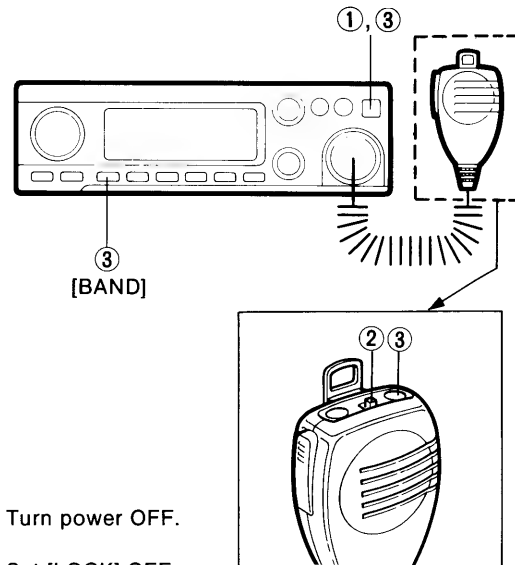
By using this function, you can easily and speedily access an often-used switch without stretching your arm.

WITH POWER ON

- 1) Turn power OFF.
- 2) Set [LOCK] on the microphone to the OFF position.
- 3) While pushing and holding [UP] on the microphone and the desired switch on the front panel, turn power ON.
 - The [UP] switch functions as the desired switch.
 - The [DN] switch functions as a scan start switch after this setting, and the main dial changes its scan direction.
- 3) To cancel this function, turn power OFF, then while pushing and holding [UP], turn power ON.

[EXAMPLE]

The following example shows how to access [BAND] using [UP] on the microphone.



- 1) Turn power OFF.
- 2) Set [LOCK] OFF.
- 3) While pushing and holding [UP] and [BAND], turn power ON.
 - [UP] functions as [BAND].
 - [DN] functions as the scan start switch.

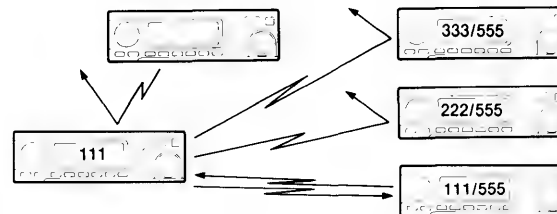
■ Selective calling system

Each function shown below is useful for calling a specific station or for standby from a specific station. To operate these functions, an optional UT-50 or UT-55 is necessary. See p. 36 for installation.

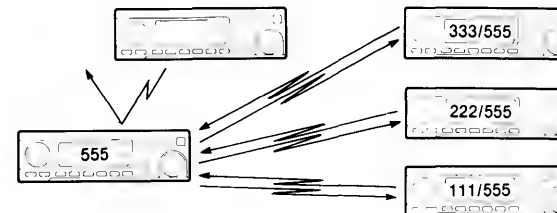
	SYSTEM	DESCRIPTION	OPTION
SELECTIVE CALLING	POCKET BEEP	This function alerts you with approx. 30 sec. beep tones and the " (i.o) " indicator flashing when a signal with the same subaudible tone as that pre-programmed is received.	UT-50
	PAGER	This function displays the received ID code with beeps. ID codes can be independently programmed in each station. You can therefore choose to call a personal station or group stations.	UT-55
COMMUNICATION	STONE SQUELCH	When a signal with the same subaudible tone as that pre-programmed is received, the squelch opens. You can silently wait for a call from your group.	UT-50
	CODE SQUELCH	When a signal with the same ID code as that pre-programmed is received, the squelch opens. Or a group call can be selected in the same way as the pager function.	UT-55

The pocket beep and pager or code squelch cannot be used at the same time.

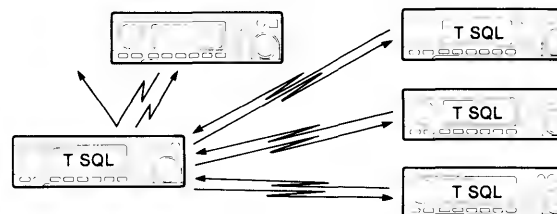
• Pager and code squelch (Personal call)



• Pager and code squelch (Group call)



• Pocket beep and tone squelch



10 SELECTIVE CALLING

■ Code memory

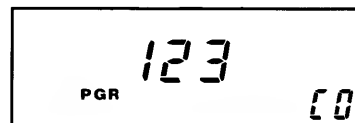
The pager and code squelch functions require ID codes, and ID codes must be written in the code memory channels before operation.

An optional UT-55 DTMF ENCODER/DECODER UNIT is necessary for operation.

(1) Pre-operation

- 1) Install optional UT-55 units in your group transceivers.
 - Some other Icom transceivers are compatible. Ask your Icom Dealer for details.
- 2) Decide the ID code of each transceiver and the group code in your group.
- 3) Decide whether to return to normal operation or code squelch operation after contact.
- 4) Program the ID code, group code, and other station's ID codes as a transmit code.
 - Your ID code should be programmed into the code memory channel C0.
 - Program "Receive inhibit" on channels programmed as transmit codes.

(2) Code memory channel information



ID or group code	Code memory channel	Receive "Accept" or "Inhibit"
Your ID code	C0	"Accept" only
Other station's ID codes (Transmit code)	C1~C5	"Inhibit" should be programmed in each channel.
Group code	One of C1~C5	"Accept" should be programmed.
Memorizing space*	CP	"Inhibit" only

* Channel CP automatically memorizes an ID code when receiving a pager call. The contents in the channel CP cannot be changed manually.

NOTE: Channels C1~C5 can be programmed with another station's ID code or group code. We recommend that the same channel each of the group transceivers is used for group code programming.

(3) Programming a code memory

- 1) Push [PGR/CS] to select the pager function.
 - “PGR” appears
- 2) Push [SET] to call up a code memory.
 - Code memory number blinks.
- 3) Rotate the main dial to select the code memory number for programming.
- 4) Push [SET] or [HI/LO] to select the desired digit to be programmed.
- 5) Rotate the main dial to set the digit.
- 6) Repeat steps 4 and 5 until the code memory is completed.
- 7) Push [PGR/CS] to select “Receive accept” or “Receive inhibit”. See at right for details.
- 8) When writing other code memories, repeat steps 3~7.
- 9) Push PTT or one of the switches on the front panel except [PGR/CS], [HI/LO] or [SET] to set the value and to return to the previous mode.

•SETTING “RECEIVE ACCEPT” OR “RECEIVE INHIBIT”

The code memory channels C1~C5 can be programmed as “Receive accept” or “Receive inhibit”.

- “Receive accept” (The “SKIP” indicator does not illuminate.) accepts calls when the transceiver receives a signal with a code the same as that in the code memory.
- “Receive inhibit” (The “SKIP” indicator illuminates.) rejects calls when the transceiver receives a signal with a code the same as that in the code memory.

The code memory channel that stores the group code should be programmed as “Receive accept”. The code memory channels that store other station's ID codes (Transmit codes) should be programmed as “Receive inhibit.”

For setting the condition, see item 7 at left.

■ Pager operation

This function operates as part of a selective calling system. Note that the operations of the calling station and stand-by station are different.

An optional UT-55 DTMF ENCODER/DECODER UNIT is necessary for the pager operation.

• Calling a specific station

- 1) Push [PGR/CS] to activate the pager function.
 - “PGR” appears.
- 2) Select another station's ID code or group code (transmit code) from code memory C1~C5.
 - See p. 32 for code memory programming.
- 3) Push PTT to transmit a code with 7 DTMF digits (transmit code + “*” + your ID code).
- 4) Wait for an answer back call.
 - When the transceiver receives an answer back call, the function display shows the other station's ID or group code.
- 5) After confirming a connection, push any switch to return the display, then push [PGR/CS] once to select code squelch or twice to select normal operation.

• Waiting for a call from a specific station

- 1) Push [PGR/CS] to activate the pager function.
 - “PGR” appears.
- 2) When receiving a call with a correct code, the transceiver emits a beep and the function display shows the code ①, ② or ③ as follows:
 - ① When called with your ID code: The function display shows the other station's ID code and “CP”.
 - ② When called with your group code: The function display shows the group code and code memory number that is written in the group code.
 - ③ When the other station's ID code is not received completely because of interference, etc.: The function display shows the last-used code and “E” as the code memory number instead of “C”.
- 3) Push PTT to send an answer back call.
 - Your ID code is transmitted.
- 4) Push [PGR/CS] once to select code squelch or twice to select normal operation.

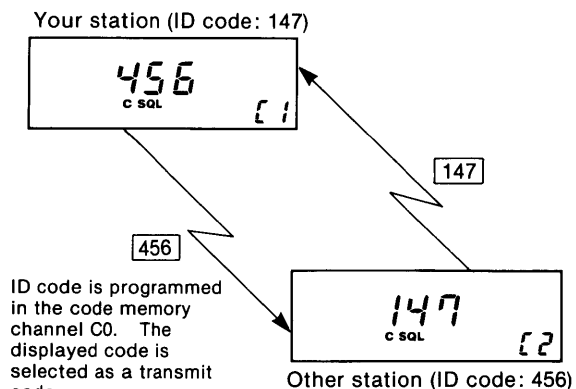
■ Code squelch operation

An optional UT-55 DTMF ENCODER/DECODER UNIT is necessary for this operation.

(1) Pre-operation

- 1) Decide the ID code for each transceiver and the group code in your group.
- 2) Program your ID code, group code, and the other station's ID codes as transmit codes. See p. 31 for details.

• CODE SQUELCH OPERATION EXAMPLE



(2) Code squelch operation

- 1) Set the operating band and frequency.
- 2) Push [PGR/CS] until "C SQL" appears.
- 3) Push [SET] to call up a code memory.
 - Code memory number blinks.
- 4) Rotate the main dial to select another station's ID code or group code from code memory C1~C5.
 - See p. 32 for code memory programming.
- 5) Push PTT to transmit the 3-digit transmit code.
 - When the transmit code is the same as the other station's ID code or group code, the other station's code squelch opens.
- 6) When a signal with your ID code or pre-programmed group code is received, your code squelch opens.
- 7) Operate the transceiver for normal communications.
- 8) To cancel the code squelch function, push [PGR/CS].

NOTE: Make sure the code memory channel is correct when operating code squelch after using the pager function.

■ Pocket beep function

This function is used for waiting for a call from a specific station. When the transceiver receives a signal with the same subaudible tone as is pre-programmed, the transceiver emits beeps.

The calling station must set the tone squelch function.

An optional UT-50 TONE SQUELCH UNIT is necessary for this operation.

- 1) Set the operating band and frequency.
- 2) Set a tone frequency using SET mode. See p. 20 for details.
- 3) Push [T/T. SQL] until "T SQL (●●)" appears.
- 4) When a signal with the correct tone is received, the transceiver emits beeps for 30 sec. and flashes "(●●)".
- 5) Push any switch to stop the beeping and flashing.
 - The tone squelch function is automatically activated.

■ Tone squelch function

An optional UT-50 TONE SQUELCH UNIT is necessary for this operation.

- 1) Set the operating band and frequency.
- 2) Set a tone frequency using SET mode. See p. 20 for details.
- 3) Push [T/T. SQL] until "T SQL" appears.
- 4) When the correct tone is received, the squelch opens and the signal can be heard.
 - When an incorrect tone frequency is received the squelch does not open. However, the "BUSY" indicator appears.
 - Push [MONI] to open the squelch manually.
- 5) Operate the transceiver for normal communications.
- 6) To cancel the tone squelch function, push [T/T SQL] until "T SQL" disappears.

CONVENIENT

Tone squelch with a tone frequency can be programmed in a memory channel. Therefore, SET mode is not necessary once a memory is programmed.

There are 3 types of optional internal units available.

- **UT-50 TONE SQUELCH UNIT**

Allows you to operate a repeater (that requires a subaudible tone to access), the pocket beep function or tone squelch function.

- **UT-51 PROGRAMMABLE TONE ENCODER UNIT**

Allows you to operate a repeater (that requires a subaudible tone to access). The U.S.A. version already includes this unit.

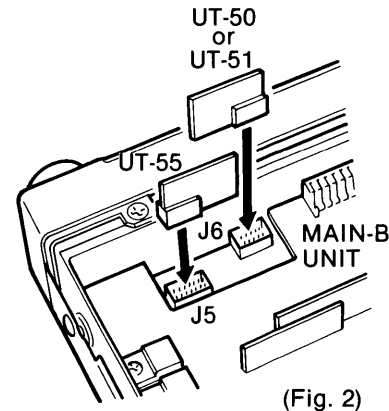
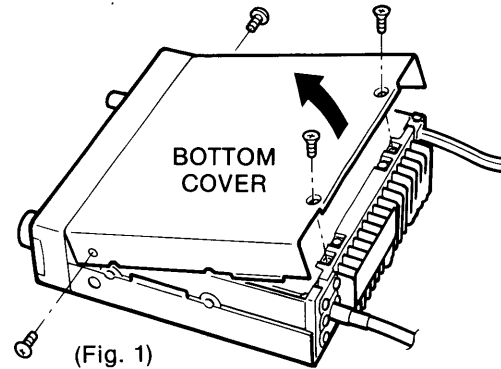
- **UT-55 DTMF ENCODER/DECODER UNIT**

Allows you to operate the pager and code squelch function.

Both UT-50 and UT-51 are not installed.

For installation, proceed with the following steps:

- 1) Remove 4 screws then remove the bottom cover as shown in the diagram at right. (Fig. 1)
- 2) Install the optional unit as shown in the diagram at right. (Fig. 2)
- 3) Replace the bottom cover and screws.



12 HM-56 ADVANCED FUNCTIONS (U.S.A. and Asia versions)

The HM-56 HAND MICROPHONE is equipped with 14 DTMF code memory channels and a re-dialing function for auto dialing. Up to a 22-digit telephone number, etc., can be memorized into each memory channel.

The HM-56 has 4 different mode types as follows:

- **Normal operating mode**

A DTMF code is transmitted when the digit key is pushed.

- **Memory writing mode [MW]**

Used when writing DTMF digits into a DTMF code memory channel in the HM-56.

The active indicator blinks fast when the mode is selected.

- **Memory reading mode [MR]**

Used when reading DTMF digits from a DTMF code memory channel in the HM-56.

The active indicator lights continuously when the mode is selected.

- **Re-dialing mode [RD]**

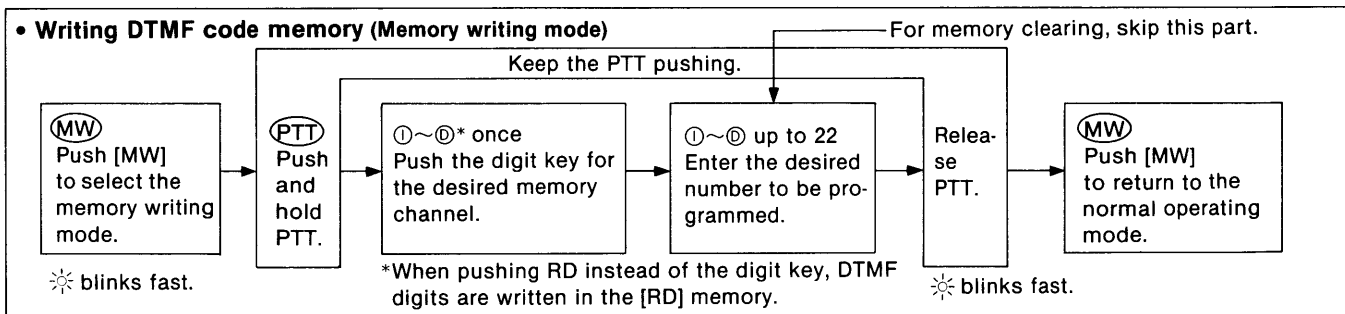
Used when recalling the last-used DTMF digits.

The active indicator blinks slowly when the mode is selected.

NOTE:

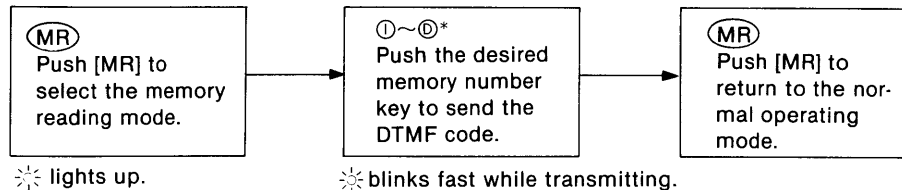
Be sure to set the [LOCK] switch on the microphone to the OFF position before HM-56 operation.

■ Writing a DTMF code memory



■ Transmitting a DTMF code

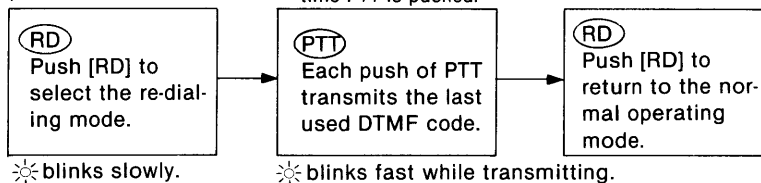
• Automatic operation with memory (Memory reading mode)



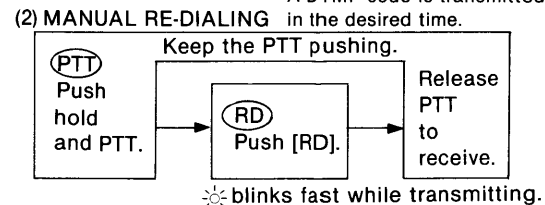
* Push and hold [#] to transmit a 1750 Hz tone continuously.
Push [*] to transmit a 1750 Hz tone for approx. 0.5 sec.

• Re-dialing operation (Re-dialing mode)

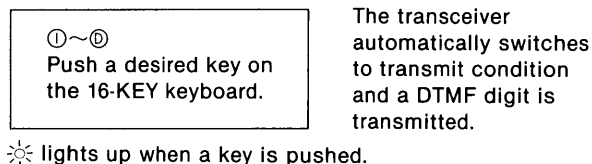
(1) **AUTOMATIC RE-DIALING** A DTMF code is transmitted each time PTT is pushed.



(Normal operating mode) A DTMF code is transmitted in the desired time.



• Manual operation with the 16-KEY keyboard (Normal operating mode)



■ HM-56 CPU resetting

The CPU in the HM-56 can be reset to clear all memorized information.

- 1) Turn the transceiver power OFF.
- 2) Push and hold [MW] and [MR] on the microphone, then turn the transceiver power ON again.
- 3) Release [MW] and [MR].

13 MAINTENANCE

Troubleshooting

PROBLEM	POSSIBLE CAUSE	SOLUTION	REF.
<ul style="list-style-type: none"> No power comes on. 	<ul style="list-style-type: none"> Power connector has a poor contact. Polarity of the power connection is reversed. Blown fuse. 	<ul style="list-style-type: none"> Check the connector pins. Reconnect the power cable observing the proper polarity. Check the cause, then replace the fuse. 	<p>p. 10</p> <p>p. 40</p>
<ul style="list-style-type: none"> No sound comes from the speaker. 	<ul style="list-style-type: none"> [SQL] is turned too far clockwise. The optional tone or code squelch is turned ON. 	<ul style="list-style-type: none"> Set [SQL] at the threshold point. Turn OFF the tone or code squelch. 	<p>p. 15</p> <p>pgs. 34, 35</p>
<ul style="list-style-type: none"> Sensitivity is low and only strong signals are audible. 	<ul style="list-style-type: none"> Antenna feedline or the soldering of antenna connector is cut or short circuited. 	<ul style="list-style-type: none"> Check, and if necessary, replace the feedline or solder the antenna connector again. 	<p>p. 11</p>
<ul style="list-style-type: none"> No contact possible with another station. 	<ul style="list-style-type: none"> The transceiver is set to semi duplex. The other station is using the tone or code squelch. 	<ul style="list-style-type: none"> Set to simplex. Turn ON the tone or code squelch. (UT-50 or UT-55 is necessary.) 	<p>p. 17</p> <p>pgs. 34, 35</p>
<ul style="list-style-type: none"> Repeater cannot be accessed. 	<ul style="list-style-type: none"> Wrong offset frequency is programmed. Wrong subaudible tone frequency is programmed. 	<ul style="list-style-type: none"> Correct the offset frequency. Correct the subaudible tone frequency. 	<p>p. 19</p> <p>p. 20</p>
<ul style="list-style-type: none"> Frequency cannot be set. 	<ul style="list-style-type: none"> The dial lock function is activated. 	<ul style="list-style-type: none"> Turn OFF the function. 	<p>p. 15</p>
<ul style="list-style-type: none"> Scan does not operate. 	<ul style="list-style-type: none"> Squelch is open. Scan edge P1 equals P2 (for programmed scan). All memory channels are programmed as the skip channel (for memory scan). 	<ul style="list-style-type: none"> Set [SQL] at the threshold point. Reset scan edges. Cancel the memory skip function in the desired channel. 	<p>p. 25</p> <p>p. 25</p> <p>p. 25</p>
<ul style="list-style-type: none"> All programmed memories have been erased. 	<ul style="list-style-type: none"> The CPU multifunctions. Backup battery is empty. 	<ul style="list-style-type: none"> Reset the CPU. Send the transceiver to an authorized Icom Dealer or Service Center to replace the backup battery. 	<p>p. 40</p> <p>p. 40</p>

■ CPU resetting

The function display may occasionally display erroneous information, (e.g., when first applying power). This may be caused externally by static electricity or other factors.

If this problem occurs, turn power OFF. Wait a few seconds, then turn power ON again. If the problem continues, perform the following procedure.

NOTE: CPU resetting CLEARS all memory information, and initializes all values.

- 1) Turn power OFF.
- 2) While pushing [SET] and [MW], turn power ON.
 - All segments appear on the function display, then the CPU is reset.

■ Cleaning

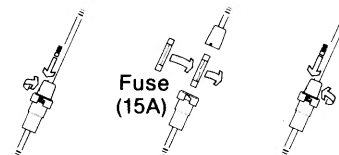
If the transceiver becomes dusty or dirty, wipe it clean with a dry, soft cloth.

AVOID the use of chemical agents such as benzine or alcohol, as they can damage the transceiver surfaces.

■ Fuse replacement

If the fuse blows or the receiver stops functioning, find the source of the problem if possible, and replace the damaged fuse with a new, rated fuse as shown in the diagram below.

• Replacing a fuse



■ Backup batteries

The IC-3220A/E/H and HM-56 are equipped with separate lithium backup batteries for retaining memory information.

The life of the lithium backup batteries is usually more than 5 years. When the batteries are exhausted, the transceiver operates normally but the CPU cannot retain memory information.

NOTE: DO NOT attempt to replace the backup batteries yourself. They can be replaced only by an authorized Icom Dealer or Service Center.

14 SPECIFICATIONS

■ GENERAL

- Frequency coverage :

VERSION	VHF	UHF
U.S.A.	140.000~150.000*1 (Tx) 136.000~174.000*1 (Rx)	440.000~450.000
Italy	136.000~174.000*1	400.000~479.000*2
Europe	144.000~146.000	430.000~440.000
Australia	144.000~148.000	430.000~440.000
Asia	140.000~150.000*1 (Tx) 136.000~174.000*1 (Rx)	430.000~440.000

Unit: MHz

*1 Specifications guaranteed 144.000~148.000 MHz.

*2 Specifications guaranteed 430.000~440.000 MHz.

- Mode : FM (F3)
- Antenna impedance : 50 Ω unbalanced
- Acceptable external power : 13.8 V DC \pm 15 %
- Usable temperature range : -10°C ~ +60°C (+14°F ~ +140°F)
- Dimensions : 140 (W) \times 40 (H) \times 195 (D) mm
5.5 (W) \times 1.6 (H) \times 7.7 (D) in
(projections not included)
- Weight : 1.4 kg (3.1 lb)

■ TRANSMITTER

- Modulation system : Variable reactance frequency modulation
- Max. frequency deviation : \pm 5 kHz
- Spurious emissions : Less than -60 dB
- Microphone impedance : 600 Ω

- Output power and current drain (at 13.8 V DC) :

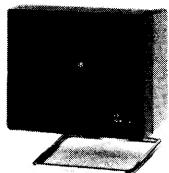
		IC-3220A/E		IC-3220H	
		POWER	CURRENT	POWER	CURRENT
VHF	High	25 W	7.0 A	45 W	10.0 A
	Low-2	10 W	4.5 A	10 W	5.0 A
	Low-1	1 W	2.5 A	5 W	4.0 A
UHF	High	25 W	8.0 A	35 W	10.0 A
	Low-2	10 W	5.0 A	10 W	6.0 A
	Low-1	1 W	3.0 A	5 W	4.5 A

■ RECEIVER

- Receive system : Double conversion superheterodyne
- Intermediate frequencies : 1st 17.2 MHz (VHF)
30.875 MHz (UHF)
2nd 455 kHz
- Sensitivity : Less than 0.16 μ V for 12 dB SINAD
- Squelch threshold sensitivity : Less than 0.13 μ V
- Selectivity : More than 15 kHz/-6 dB
Less than 30 kHz/-60 dB
- Spurious rejection ratio : More than 60 dB
- Audio output power : More than 2.4 W at 10 % distortion with an 8 Ω load
- Current drain : Max. audio output 1.2 A
Squelched 800 mA

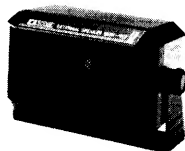
All stated specifications are subject to change without notice or obligation.

SP-7 EXTERNAL SPEAKER



8 Ω , 5 W.

SP-10 EXTERNAL SPEAKER



4 Ω , 5 W.

SP-12 EXTERNAL SPEAKER



8 Ω , 3 W.

IC-PS30 AC POWER SUPPLY



13.8 V DC, 25 A.

SM-6 DESKTOP MICROPHONE



SM-8 DESKTOP MICROPHONE



HS-15 FLEXIBLE MOBILE MICROPHONE



Used with the HS-15SB.

HS-15SB SWITCHBOX



For the HS-15.

AH-32 144/430 (440) MHz DUAL BAND ANTENNA

Dual band mobile antenna.
Frequency range: 144~148 MHz,
430~450 MHz
Max. input power: 150 W

AHB-32 TRUNK MOUNT

Trunk mount with a coaxial cable for the AH-32.

HM-56 HAND MICROPHONE

Has DTMF function and DTMF memories.

HM-58 HAND MICROPHONE

HM-59 HAND MICROPHONE
Has 1750 Hz tone call function.

MB-27 MOBILE MOUNTING BRACKET

Same type as supplied with the IC-3220A/E/H.

MB-34 JOINT PLATES

Stack with IC-229 series transceivers.

OPC-044B DC POWER CABLE

Same type as supplied with the IC-3220A/E/H.

PS-45 AC POWER SUPPLY

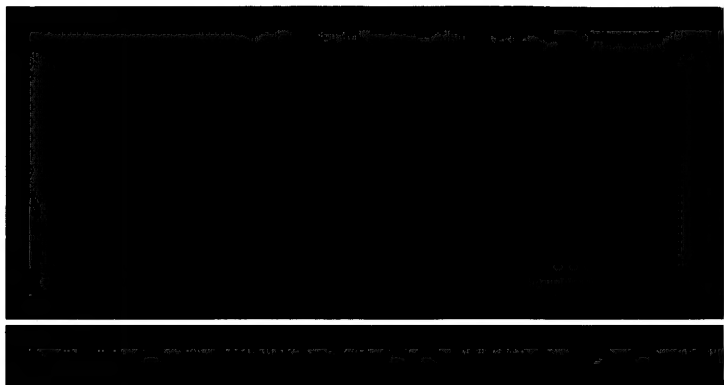
13.8 V DC, 8 A. For the IC-3220A/E.
Not available for the IC-3220H.

UT-50 TONE SQUELCH UNIT

UT-51 PROGRAMMABLE TONE ENCODER UNIT

UT-55 DTMF ENCODER/DECODER UNIT

Count on us!



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